TigerSwitch 10/100

24-Port Fast Ethernet Switch

- 24 10BASE-T/100BASE-TX ports
- Optional 1000BASE-SX modules
- 8.8 Gbps of aggregate bandwidth
- Spanning Tree Protocol
- Up to four port trunks
- Port mirroring for non-intrusive analysis
- QoS support for four-level priority
- Full support for VLANs with GVRP
- IP Multicasting with IGMP Snooping
- Manageable via console, Web, SNMP/RMON

SMC® Networks

Installation Guide

SMC6724L2

TigerSwitch 10/100 Installation Guide

From SMC's Tiger line of feature-rich workgroup LAN solutions

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COMPLIANCES

FCC - Class A

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart B of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

You may use unshielded twisted-pair (UTP) cable for RJ-45 connections—Category 3 or greater for 10 Mbps connections and Category 5 for 100 Mbps connections. Use 50/125 or 62.5/125 micron multimode fiber optic cable for SC or ST-type connections.

Warnings 1. Wear an anti-static wrist strap or take other suitable measures to prevent electrostatic discharge when handling this equipment.

2. When connecting this hub to a power outlet, connect the field ground lead on the tri-pole power plug to a valid earth ground line to prevent electrical hazards.

EC Conformance Declaration - Class A

SMC contact for these products in Europe is:

SMC Networks Europe,
Edificio Conata II,
Calle Fructuós Gelabert 6-8, 2º, 4ª,
08970 - Sant Joan Despí,
Barcelona, Spain.

This information technology equipment complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC, and carries the CE Mark accordingly. It conforms to the following specifications:

EMC:	EN55022 (1988)/CISPR-22 (1995) Class A	
	IEC 1000-4-2	4 kV CD, 8 kV AD
	IEC 1000-4-3 (1995)	3 V/m
	IEC 1000-4-4 (1995)	1.0 kV - (power line)
		0.5 kV - (signal line)
	IEC 1000-4-6 (1995)	3 Vrms

Industry Canada - Class A

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-003 édictée par le ministère des Communications.

Japan VCCI Class A

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Australia AS/NZS 3548 (1995) - Class A

ACN 069 351 613

SMC contact for products in Australia is:

SMC Communications Pty. Ltd.
Suite 18, 12 Tryon Road,
Lindfield NSW2070,
Phone: 61-2-94160437
Fax: 61-2-94160474

Safety Compliance

Warning: Fiber Optic Port Safety

When using a fiber optic port, never look at the transmit laser while it is powered on. Also, never look directly at the fiber TX port and fiber cable ends when they are powered on.

Avertissment: Ports pour fibres optiques - sécurité sur le plan optique

Ne regardez jamais le laser tant qu'il est sous tension. Ne regardez jamais directement le port TX (Transmission) à fibres optiques et les embouts de câbles à fibres optiques tant qu'ils sont sous tension.

Warnhinweis: Faseroptikanschlüsse - Optische Sicherheit

Niemals ein Übertragungslaser betrachten, während dieses eingeschaltet ist. Niemals direkt auf den Faser-TX-Anschluß und auf die Faserkabelenden schauen, während diese eingeschaltet sind.

Underwriters Laboratories Compliance Statement

Important! Before making connections, make sure you have the correct cord set. Check it (read the label on the cable) against the following:

Operating Voltage	**Cord Set Specifications**
120 Volts	UL Listed/CSA Certified Cord Set
	Minimum 18 AWG
	Type SVT or SJT three conductor cord
	Maximum length of 15 feet
	Parallel blade, grounding type attachment plug rated 15A, 125V
240 Volts (Europe only)	Cord Set with H05VV-F cord having three conductors with minimum diameter of 0.75 mm^2
	IEC-320 receptacle
	Male plug rated 10A, 250V

The unit automatically matches the connected input voltage. Therefore, no additional adjustments are necessary when connecting it to any input voltage within the range marked on the rear panel.

Wichtige Sicherheitshinweise (Germany)

1. Bitte lesen Sie diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den späteren Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie keine Flüssigoder Aerosolreiniger. Am besten eignet sich ein angefeuchtetes Tuch zur Reinigung.
4. Die Netzanschlu ßsteckdose soll nahe dem Gerät angebracht und leicht zugänglich sein.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sicheren Stand zu achten. Ein Kippen oder Fallen könnte Beschädigungen hervorrufen.
7. Die Belüftungsöffnungen dienen der Luftzirkulation, die das Gerät vor Überhitzung schützt. Sorgen Sie dafür, daß diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim Anschluß an das Stromnetz die Anschlußwerte.
9. Verlegen Sie die Netzanschlußleitung so, daß niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
10. Alle Hinweise und Warnungen, die sich am Gerät befinden, sind zu beachten.
11. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.
12. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. elektrischen Schlag auslösen.
13. Öffnen sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von authorisiertem Servicepersonal geöffnet werden.
14. Wenn folgende Situationen auftreten ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
    a. Netzkabel oder Netzstecker sind beschädigt.
    b. Flüssigkeit ist in das Gerät eingedrungen.
    c. Das Gerät war Feuchtigkeit ausgesetzt.
    d. Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
    e. Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
    f. Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
15. Zum Netzanschluß dieses Gerätes ist eine geprüfte Leitung zu verwenden. Für einen Nennstrom bis 6A und einem Gerätegewicht größer 3kg ist eine Leitung nicht leichter als H05VV-F, 3G, 0.75mm^2 einzusetzen.

Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70dB(A) oder weniger.

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CHAPTER 1
ABOUT THE TIGERSWITCH 10/100

Overview

SMC's TigerSwitch™ 10/100 is a fast Ethernet switch with 24 10BASE-T/100BASE-TX ports, plus two slots for optional slide-in 1000BASE-SX modules. There is also an SNMP-based management agent embedded on the main board. This agent supports both in-band and out-of-band access for managing the switch.

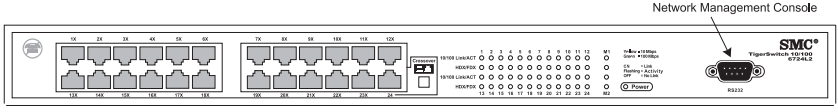

Figure 1-1. SMC6724L2 Front Panel

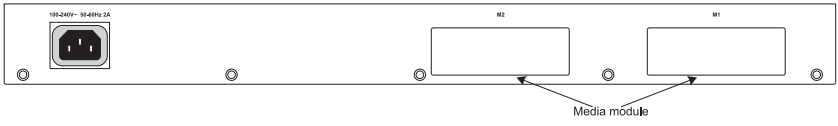

Figure 1-2. SMC6724L2 Rear Panel

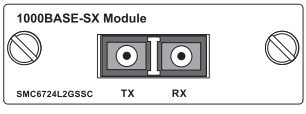

Figure 1-3. Optional 1000Base-SX Module

Switch Architecture

The TigerSwitch employs a high-speed switching fabric. This design allows for simultaneous transport of multiple packets at low latency on all ports. It also uses store-and-forward switching to ensure maximum data integrity. In this mode, the entire packet must be received into a port buffer and checked for validity before being forwarded. This prevents errors from being propagated throughout the network. This switch also features full-duplex capability on all ports, which effectively doubles the bandwidth of each connection.

This switch also includes two slots on the rear panel for optional Gigabit modules that can be used to uplink to a collapsed Gigabit backbone or for a high-speed server connection.

Management Options

This switch contains a comprehensive array of LEDs for "at-a-glance" monitoring of network and port status. It also includes a management agent that allows the switch to be managed in-band via SNMP or RMON (Groups 1, 2, 3 and 9) protocols, with a Web browser, or remotely via Telnet. The switch also provides a serial port on the front panel for out-of-band management.

Description of Hardware

10BASE-T/100BASE-TX Ports (SMC6724L2)

These ports are dual-speed RJ-45 ports. Ports 1 through 23 are labeled with an "x" to indicate that they have a built-in crossover (MDI-X). Workstations and servers can be connected to these ports with straight-through cable. Port 24 is switch-selectable (MDI-X or MDI). There is an associated switch that is used to enable and disable the crossover, so this port can always be connected to another hub or switch with straight-through cable. When connecting to another switch or a hub, you can also use straight-through cable to connect any port on the switch to a port on the attached device that does not have built-in wiring crossovers (MDI), or use crossover cabling. (See Appendix B for a pinout description of crossover cable.)

Each of these ports support auto-negotiation, so the optimum transmission mode (half or full duplex), and data rate (10 or 100 Mbps) can be selected automatically. If a device connected to one of these ports does not support auto-negotiation, the communication mode of that port can be configured manually. Each port also supports auto-negotiation of IEEE 802.3x full-duplex flow control, so the switch can automatically prevent port buffers from becoming saturated.

Status LEDs

The LEDs, which are located on the front panel for easy viewing, are shown below and described in the following table.

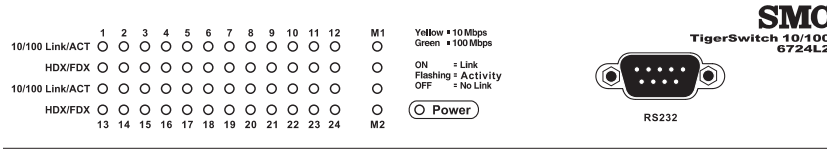

Figure 1-4. Port and System LEDs

Port and System Status LEDs		
LED	**Condition**	**Status**
Power	On	Switch is receiving power.
RJ-45 Ports		
Link & Activity	On	Port has established a valid network connection.
	Yellow	Valid 10 Mbps connection.
	Green	Valid 100 Mbps connection.
	Flashing	Traffic is passing through the port.
FDX	On	Port is operating at full duplex.
HDX	Off	Port is operating at half duplex.
Module Ports		
Link & Activity	On	A module is installed in this slot.
	Yellow	Communications have been set to 1000 Mbps.
	Flashing	Traffic is passing through the module.

Switch Management

This switch includes a built-in management agent that offers a variety of management options, including SNMP, RMON and a Web-based interface. The switch also includes an RS-232 serial port for out-of-band management. A PC may be connected to this port for configuration and monitoring purposes out-of-band via a full-handshaking null-modem cable.

The management agent provides a wide range of advanced performance-enhancing features. Multicast filtering provides support for real-time network applications. Port-based and tagged VLANs, plus support for automatic GVRP VLAN registration provide traffic security and efficient use of network bandwidth. QoS priority queueing ensures the minimum delay for moving real-time multimedia data across the network. Flow control eliminates the loss of packets due to bottlenecks caused by port saturation. And broadcast storm control prevents broadcast traffic storms from engulfing the network.

Some of the switch's advanced features are described below. For a detailed description, refer to the Management Guide.

Spanning Tree Protocol

The TigerSwitch 10/100 supports IEEE 802.1D Spanning Tree Protocol. This protocol adds a level of fault tolerance by allowing two or more redundant connections to be created between a pair of LAN segments. When there are multiple physical paths between segments, this protocol will choose a single path and disable all others to ensure that only one route exists between any two stations on the network. This prevents the creation of network loops. However, if the chosen path should fail for any reason, an alternate path will be activated to maintain the connection.

The default setting for the Spanning Tree Protocol is "enabled." This protocol may be configured out-of-band via the serial console

port, or in-band via the Web interface, Telnet, or SNMP network management software.

VLANs

The TigerSwitch 10/100 supports up to 64 VLANs. A Virtual LAN is a collection of network nodes that share the same collision domain regardless of their physical location or connection point in the network. By segmenting your network into VLANs, you can:

- Eliminate broadcast storms which severely degrade performance in a flat network.
- Simplify network management for node changes/moves by remotely configuring VLAN membership for any port, rather than having to manually change the node's IP address.
- Provides data security by restricting all traffic to the originating VLAN, except where a connection has been configured between separate VLANs using a router or Layer 3 switch.

Multicast Switching

Specific multicast traffic can be assigned to its own VLAN to ensure that it does not interfere with normal network traffic and to guarantee real-time delivery by setting the required priority level for the designated VLAN. The switch uses IGMP Snooping and IGMP to manage multicast group registration.

Traffic Priority

This switch provides Quality of Service (QoS) by prioritizing each packet based on the required level of service, using four distinct categories with Weighted Round Robin Queuing. It uses IEEE 802.1p and 802.1Q tags to prioritize incoming traffic based on input from the end-station application. These functions can be used to provide independent priorities for delay-sensitive data and best-effort data.

Optional Media Extender Module

Optional 1000BASE-SX Module (SMC6724L2GSSC)

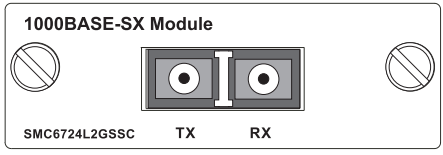

Figure 1-5. Single-Port 1000BASE-SX Gigabit Module

Using fiber optic cable, the 1000BASE-SX port can be connected to a remote site up to 550 m (1805 ft.) away. The 1000BASE-SX Gigabit module operates at 1 Gbps, with support for full-duplex mode and flow control. This module is fitted with an SC connector, but you can attach an ST plug to the switch using the SC-ST Converter (Part Number: 99-012034-091).

Power Supply Receptacle

The power receptacle is located on the rear panel of the switch. The standard power receptacle is for the AC power cord.

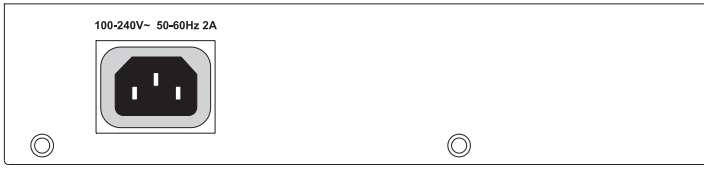

Figure 1-6. Power Supply Receptacle

Features and Benefits

Connectivity

- 24 dual-speed ports for easy Fast Ethernet integration and for protection of your investment in legacy LAN equipment
- Auto-negotiation enables each RJ-45 port to automatically select the optimum communication mode (half or full duplex and 10 or 100 Mbps) if this feature is supported by the attached device; otherwise the port can be configured manually
- Independent RJ-45 10BASE-T/100BASE-TX ports with built-in wiring crossovers for straight-through cable connections
- Unshielded (UTP) cable supported on all RJ-45 ports: Category 3, 4 or 5 for 10 Mbps connections and Category 5 for 100 Mbps connections
- IEEE 802.3 Ethernet and 802.3u Fast Ethernet compliance ensures compatibility with standards-based hubs, network cards and switches from any vendor

Expandability

- Optional 1000BASE-SX Gigabit module that can run up to 550 meters (using 50/125 micron, 500 MHz/km fiber cable), and operates at 1 Gbps, full duplex, with auto-negotiation for flow control

Performance

- Transparent bridging
- Aggregate bandwidth up to 8.8 Gbps
- Switching Table with 12K MAC address entries
- Provides Store-and-Forward switching
- Filtering and forwarding at line speed
- Broadcast storm control
- Desktop or rack-mountable
- Limited lifetime warranty

Management

- "At-a-glance" LEDs for easy troubleshooting
- Management agent:
  - Supports Telnet, SNMP/RMON and Web-based interface
  - Manages entire switch in-band or out-of-band
  - Spanning Tree Protocol for redundant network connections
  - VLAN support for 64 groups, port-based or with 802.1Q VLAN tagging, and GVRP for automatic VLAN learning
  - Quality of Service (QoS) supports two levels of priority and Weighted Round Robin Queueing
  - Multicast Switching based on IGMP (Internet Group Management Protocol) Snooping and Multicast Filtering

CHAPTER 2
NETWORK PLANNING

Introduction to Switching

A network switch allows simultaneous transmission of multiple packets via non-crossbar switching. This means that it can partition a network more efficiently than bridges or routers. The switch has, therefore, been recognized as one of the most important building blocks for today's networking technology.

When performance bottlenecks are caused by congestion at the network access point (such as the network card for a high-volume file server), the device experiencing congestion (server, power user or hub) can be attached directly to a switched port. And, by using full-duplex mode, the bandwidth of the dedicated segment can be doubled to maximize throughput.

When networks are based on repeater (hub) technology, the maximum distance between end stations is limited. For Ethernet, there may be up to four hubs between any pair of stations; for Fast Ethernet, the maximum is two. This is known as the hop count. However, a switch turns the hop count back to zero. So subdividing the network into smaller and more manageable segments, and linking them to the larger network by means of a switch, removes this limitation.

A switch can be easily configured in any Ethernet or Fast Ethernet network to significantly boost bandwidth while using conventional cabling and network cards.

Sample Applications

The TigerSwitch 10/100 is not only designed to segment your network, but also to provide a wide range of options in setting up network connections. Some typical applications are described below.

Collapsed Backbone

The TigerSwitch 10/100 is an excellent choice for mixed Ethernet and Fast Ethernet installations where significant growth is expected in the near future. You can easily build on this basic configuration, adding direct full-duplex connections to workstations or servers. When the time comes for further expansion, just cascade the TigerSwitch to an Ethernet or Fast Ethernet hub or switch, or link to another workgroup using a Gigabit connection.

In the figure below, the TigerSwitch 10/100 is operating as a collapsed backbone for a small LAN. It is providing dedicated 20 Mbps full-duplex connections to workstations and 200 Mbps full-duplex connections to power users and servers.

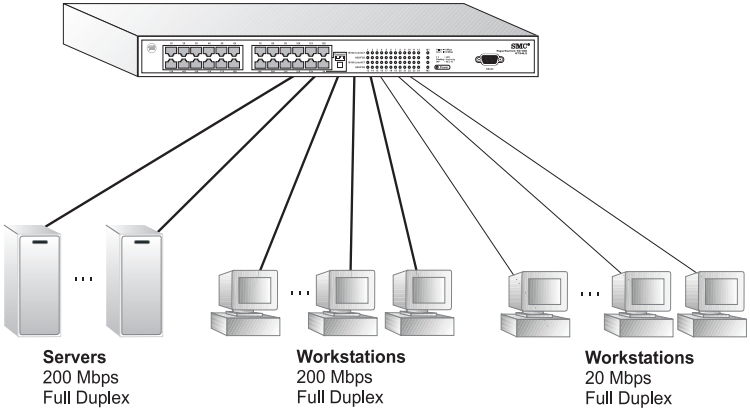

Figure 2-1. Collapsed Backbone

Remote Connections with Fiber Cable

Fiber optic technology allows for longer cabling than any other media type (up to 550 meters for 1 Gbps fiber). The TigerSwitch can serve as a collapsed backbone, providing direct connectivity for a widespread LAN. The Gigabit module can be used for a high-speed connection between floors in the same building, or to connect to other buildings in a campus setting. The figure below illustrates a TigerSwitch connecting multiple segments with fiber cable.

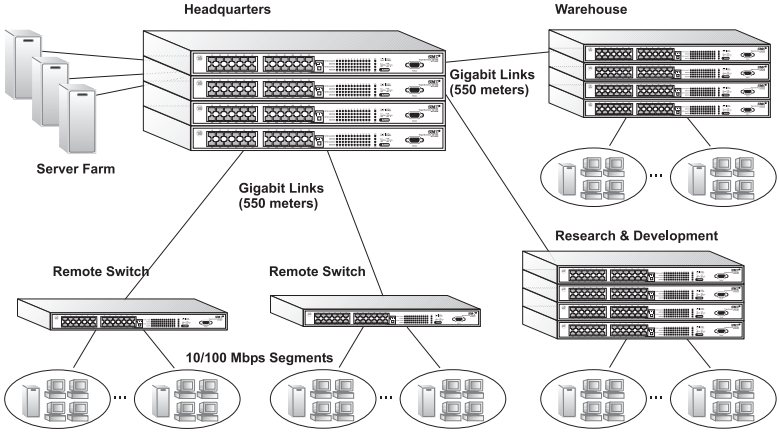

Figure 2-2. Collapsed Backbone Using Fiber Cable

Making VLAN Connections

VLANs can be based on port groups, or each data frame can be explicitly tagged to identify the VLAN group it belongs to. When using port-based VLANs, ports can either be assigned to any number of groups. Port-based VLANs are suitable for small networks. A single switch can be easily configured to support several VLAN groups for various organizational entities (such as Finance and Marketing).

When you expand port-based VLANs across several switches, you need to make a separate connection for each VLAN group. This approach is, however, inconsistent with the Spanning Tree Protocol, which can easily segregate ports that belong to the same VLAN. When VLANs cross separate switches, it is therefore better to use VLAN tagging. This allows you to assign multiple VLAN groups to the "trunk" ports (that is, tagged ports) connecting different switches.

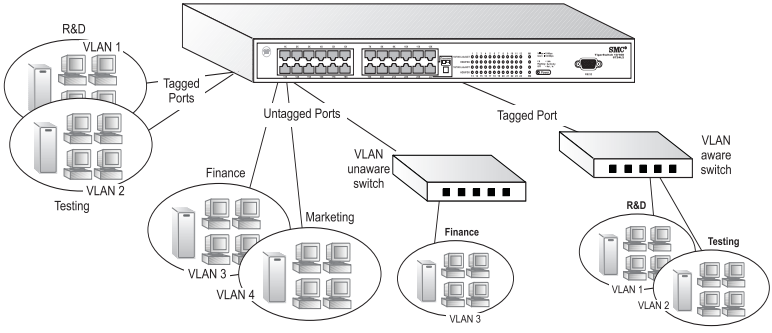

Figure 2-3. Making VLAN Connections

Note: When connecting to a switch that does not support IEEE 802.1Q VLAN tags, use untagged ports.

Connectivity Rules

When adding hubs (repeaters) to your network, please follow the connectivity rules listed below for Ethernet, Fast Ethernet, or Gigabit Ethernet. However, note that because switches break up the path for connected devices into separate collision domains, you should not include the switch or connected cabling in your calculations for cascade length involving other devices.

1000 Mbps Gigabit Ethernet Collision Domain

Maximum Fiber Optic Cable Distance for 1000BASE-SX

Fiber Size	Fiber Bandwidth	Maximum Cable Length
62.5/125 micron	160 MHz/km	7-722 ft. (2-220 m)
	200 MHz/km	7-902 ft. (2-275 m)
50/125 micron	400 MHz/km	7-1641 ft. (2-500 m)
	500 MHz/km	7-1805 ft. (2-550 m)

100 Mbps Fast Ethernet Collision Domain

SMC 3-2 Rule for Class II Repeaters

Between any two PCs or other stations in the same 100BASE-TX collision domain, there may be:

- up to 3 link segments and
- up to 2 Class II repeaters (hubs)

SMC 2-1 Rule for Class I Repeaters

Between any two PCs or other stations in the same 100BASE-TX collision domain, there may be:

- up to 2 link segments and
- up to 1 Class I repeater (hub)

Maximum Network Diameter Using Repeaters

Repeater Type and Number	Twisted Pair 100BASE-TX
1 Class I	200 m (656 ft.)
1 Class II	200 m (656 ft.)
2 Class II	205 m (672.4 ft.)

Maximum Fast Ethernet Cable Distance

Cable Type	Connecting	Max. Distance
Twisted Pair	Any two devices	100 m (328 ft.)
Fiber	Switch to switch, server or PC	
	Half duplex	412 m (1,351.4 ft.)
	Full duplex	2 km (1.24 mi.)

10 Mbps Ethernet Collision Domain

SMC 5-4-3 Rule

Between any two PCs or other stations in the same 10 Mbps collision domain, there may be:

- up to 5 link segments in series,
- up to 4 repeaters (hubs),
- up to 3 populated cable segments, that is, segments attached to two or more PCs (coax networks only).*

* The remaining two segments are unpopulated; these are known as inter-repeater links or IRLs. This distinction between populated and unpopulated segments is significant for coax networks only.

Maximum Ethernet Cable Distance

Cable Type	Maximum Length
Twisted Pair, Categories 3, 4, 5	100 m (328 ft.)
Thin Coax	185 m (607 ft.)
External Transceiver Drop	50 m (165 ft.)

Application Notes

1. Full-duplex operation only applies to point-to-point access (such as when a switch is attached to a workstation, server or another switch). When the switch is connected to a hub, both devices must operate in half-duplex mode.

2. When a switch is connected to a hub or any kind of shared media, remember to turn off back pressure to prevent the attached port from being frequently partitioned due to the jamming packets.

3. For network applications that require routing (such as when interconnecting dissimilar network types or distinct VLANs), you may have to attach the TigerSwitch 10/100 units directly to a router or Layer 3 switch (such as the SMC6724ML3).

CHAPTER 3
INSTALLING THE SWITCH

Selecting a Site

TigerSwitch 10/100 units can be mounted in a standard 19-inch equipment rack or on a flat surface. Be sure to follow the guidelines below when choosing a location.

- The site should:
  - be at the center of all the devices you want to link and near a power outlet.
  - be able to maintain its temperature within 0° to 50° C and its humidity within 5% to 95%, non-condensing
  - provide adequate space (approximately two inches) on all sides for proper air flow
  - be accessible for installing, cabling and maintaining the devices
  - allow the status LEDs to be clearly visible
- Make sure twisted-pair cable is always routed away from power lines, fluorescent lighting fixtures and other sources of electrical interference, such as radios, transmitters, etc.
- Make sure that a separate grounded power outlet that provides 100 to 240 VAC, 50 to 60 Hz, is within 8 feet of each device and is powered from an independent circuit breaker. As with any equipment, using a filter or surge suppressor is recommended.

Equipment Checklist

After unpacking the TigerSwitch 10/100, check the contents to be sure you have received all the components. Then, before beginning the installation, be sure you have all other necessary installation equipment.

Package Contents

- TigerSwitch 10/100 unit, SMC6724L2
- Four adhesive foot pads
- Bracket Mounting Kit containing two brackets and four screws for attaching the brackets to the switch
- Power Cord—either US, Continental Europe or UK
- RS-232 console cable
- This Installation Guide
- Management Guide
- SMC Warranty Registration Card—be sure to complete and return to SMC

Optional Rack-Mounting Equipment

If you plan to rack-mount the switch, be sure to have the following equipment available:

- Four mounting screws for each device you plan to install in a rack—these are not included
- A screwdriver (Phillips or flathead, depending on the type of screws used)

Mounting

A TigerSwitch 10/100 unit can be mounted in a standard 19-inch equipment rack or on a desktop or shelf. Mounting instructions for each type of site follow.

Installing Optional Modules: Before mounting the switch, be sure you install any optional modules. If you have purchased optional slide-in 1000BASE-SX media expansion modules, install these modules now, following the instructions included with the package.

Rack Mounting

Before rack mounting the switch, pay particular attention to the following factors:

- Temperature: Since the temperature within a rack assembly may be higher than the ambient room temperature, check that the rack-environment temperature is within the specified operating temperature range. (See page C-2.)
- Mechanical Loading: Do not place any equipment on top of a rack-mounted unit
- Circuit Overloading: Be sure that the supply circuit to the rack assembly is not overloaded.
- Grounding: Rack-mounted equipment should be properly grounded. Particular attention should be given to supply connections other than direct connections to the mains.

To rack-mount devices:

1. Attach the brackets to the device using the screws provided in the Bracket Mounting Kit.

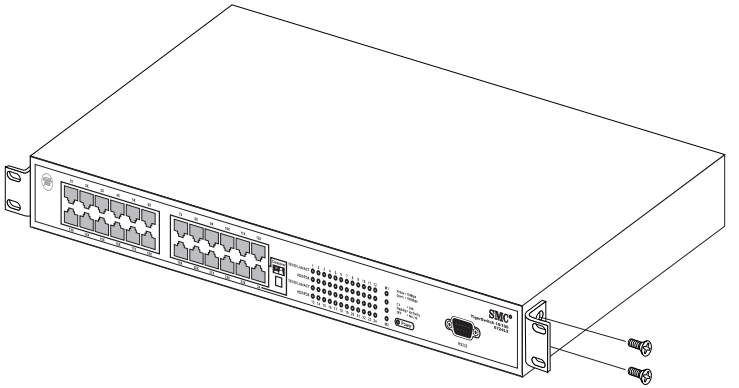

Figure 3-1. Attaching the Brackets

2. Mount the device in the rack, using four rack-mounting screws (not provided).

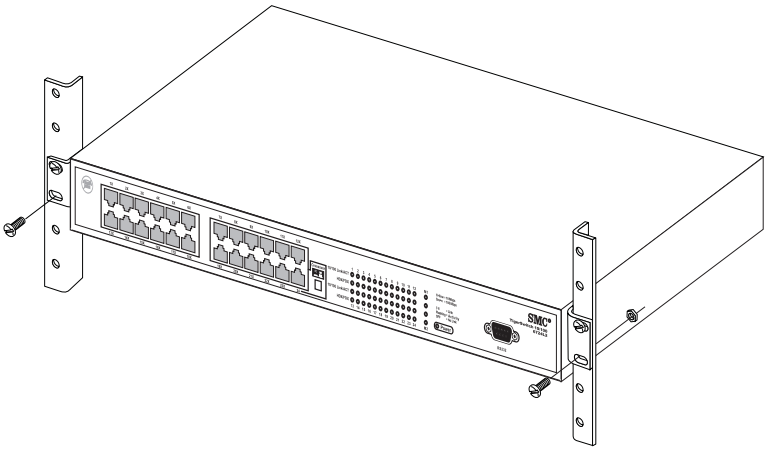

Figure 3-2. Installing the Switch in a Rack

3. If installing a single switch only, turn to "Connecting to a Power Source" at the end of this chapter.

4. If installing multiple switches, mount them in the rack, one below the other, in any order.

Desktop or Shelf Mounting

1. Attach the four adhesive feet to the bottom of the first switch.

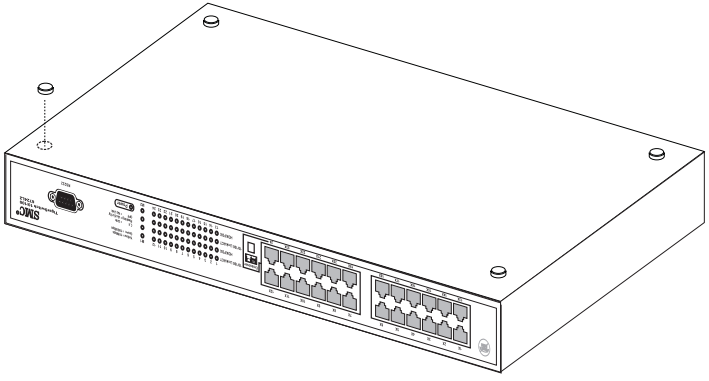

Figure 3-3. Attaching the Adhesive Feet

2. Set the device on a flat surface near an AC power source, making sure there are at least two inches of space on all sides for proper air flow.

3. If installing a single switch only, go to "Connecting to a Power Source" at the end of this chapter.

4. If installing multiple switches, attach four adhesive feet to each one. Place each device squarely on top of the one below, in any order.

Connecting to a Power Source

To connect a device to a power source:

1. Insert the power cable plug directly into the receptacle located at the back of the device.

Figure 3-4. Power Receptacle

2. Plug the other end of the cable into a grounded, 3-pin socket.

Note: For International use, you may need to change the AC line cord. You must use a line cord set that has been approved for the receptacle type in your country.

3. Check the front-panel LEDs as the device is powered on to be sure the Power LED is lit. If not, check that the power cable is correctly plugged in.

CHAPTER 4
MAKING NETWORK CONNECTIONS

Connecting Network Devices

The TigerSwitch 10/100 is designed to interconnect multiple segments (or collision domains). It may be connected to 10 or 100 Mbps network cards in PCs and servers, as well as to Ethernet and Fast Ethernet hubs, switches or routers. It may also be connected to remote devices using the optional 1000BASE-SX modules.

Note: Before connecting cables, you may want to first configure the Spanning Tree Protocol to avoid network loops. Refer to the Management Guide for more information.

Twisted-Pair Devices

Each device requires an unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. For 100BASE-TX connections, Category 5 cable is required; for 10BASE-T, Category 3, 4 or 5 cable can be used.

Cabling Guidelines

Every twisted-pair connection must have a wiring crossover to transmit and receive data. For convenience, this crossover is built into all RJ-45 ports on the switch—these are fixed crossover ports (MDI-X). Since network cards do not cross their internal wiring to

make a connection, PCs can be connected to these ports with straight-through cable.

10BASE-T/100BASE-TX hubs and switches, on the other hand, may have either crossover (MDI-X) or straight-through (MDI) ports. For this reason, the type of cable used to connect these devices to the TigerSwitch is determined by the port on the other device, as shown in the table below. (See Appendix B for further information on cabling.)

Crossover/Straight-Through Wiring Requirement		
If the port on the switch is...	*And the port on the other device is...*	*Then use...cable*
Crossover (x)	Crossover	Crossover
Crossover (x)	Straight-through	Straight-through
Straight-through (=)	Crossover	Straight-through
Straight-through (=)	Straight-through	Crossover

Warning: Do not plug a phone jack connector into an RJ-45 port. This will damage the switch. Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Connecting to PCs, Servers, Hubs and Switches

1. Attach one end of a twisted-pair cable segment to the device's RJ-45 connector.

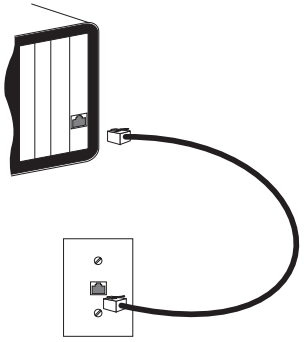

Figure 4-1. Making Twisted-Pair Connections

2. If the device is a network card and the TigerSwitch is in the wiring closet, attach the other end of the cable segment to a modular wall outlet that is connected to the wiring closet (see "Wiring Closet Connections" on the next page). Otherwise, attach the other end to an available port on the switch.

3. If the device is a hub or switch, use the cable type indicated under "Cabling Guidelines" on page 4-1, and attach the other end to a port on the TigerSwitch.

4. Make sure each twisted pair cable does not exceed 100 meters (328 ft.) in length.

Note: When connected to a shared collision domain (such as a hub with multiple workstations), switch ports must be set to half-duplex mode and back pressure flow control disabled.

5. As each connection is made, the green Link LED (on the TigerSwitch) corresponding to each port will light to indicate that the connection is valid.

Wiring Closet Connections

Today, the punch-down block is an integral part of many of the newer equipment racks. It is actually part of the patch panel. Instructions for making connections in the wiring closet with this type of equipment follows.

1. Attach one end of a patch cable to an available port on the switch, and the other end to the patch panel.

2. If not already in place, attach one end of a cable segment to the back of the patch panel where the punch-down block is located, and the other end to a modular wall outlet.

3. Label the cables to simplify future troubleshooting.

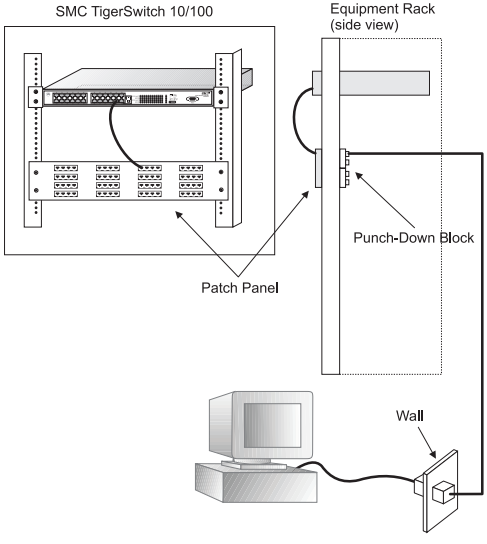

Figure 4-2. Wiring Closet Connections

Fiber Optic Devices

An optional slide-in 1000BASE-SX module may be used for a backbone connection between switches, or for connecting to a high-speed server.

Each fiber optic port requires 50/125 or 62.5/125 micron multimode fiber optic cabling with an SC connector at both ends. If you need to connect to a device with 62.5/125 micron cable that has ST-type connectors, SMC provides an optional SC-ST Converter (Part Number: 99-012034-091).

Caution: This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.

1. Remove and keep the SC port's rubber cover. When not connected to a fiber cable, the rubber cover should be replaced to protect the optics.

2. Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber optic cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.

3. Connect one end of the cable to the SC port on the switch and the other end to the SC port on the other device. Since SC connectors are keyed, the cable can be attached in only one orientation.

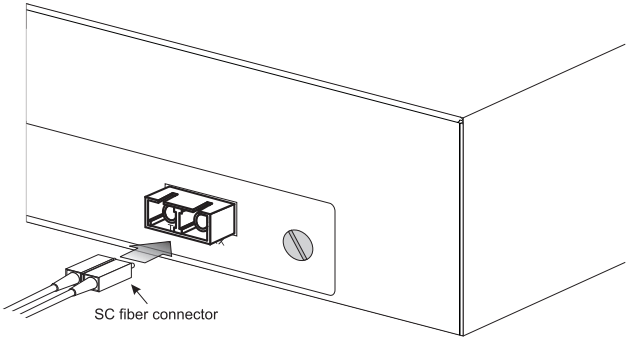

Figure 4-3. Making SC Port Connections

4. As a connection is made, check the Activity LED on the switch's front panel for the corresponding module to be sure that the connection is valid.

Note: If you use the optional SC-ST Converter, be sure to connect the converter's Tx (Rx) port to the Rx (Tx) port on the other device.

The 1000BASE-SX fiber optic ports operate at 1 Gbps full duplex, with auto-negotiation of flow control. The maximum length for fiber optic cable operating at Gigabit speed will depend on the fiber type as listed under "1000 Mbps Gigabit Ethernet Collision Domain" on page 2-5.

APPENDIX A
TROUBLESHOOTING

Diagnosing Switch Indicators

Troubleshooting Chart	
Symptom	**Action**
Power LED is Off	• Internal power supply has failed or is disconnected. • Check connections between the switch, the power cord, the wall outlet. • If the switch is installed in a rack, check the connections to the punch-down block and patch panel. • Contact SMC Tech Support.
Power LED is Flashing	• The switch is either downloading firmware or running the Power-On Self-Diagnostics Test (POST). If this LED does not stop flashing, then POST has failed, and you should contact SMC Tech Support.
Link LED is Off	• Verify that the switch and attached device are powered on. • Be sure the cable is plugged into both the switch and corresponding device. • Verify that the proper cable type is used and its length does not exceed specified limits. • Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.

Power and Cooling Problems

If the power indicator does not turn on when the power cord is plugged in, you may have a problem with the power outlet, power cord, or internal power supply. However, if the unit powers off after running for a while, check for loose power connections, power losses or surges at the power outlet, and verify that the fans on the unit are unobstructed and running prior to shutdown. If you still cannot isolate the problem, then the internal power supply may be defective. In this case, contact SMC Technical Support for assistance.

Installation

Verify that all system components have been properly installed. If one or more components appear to be malfunctioning (such as the power cord or network cabling), test them in an alternate environment where you are sure that all the other components are functioning properly.

In-Band Access

You can access the management agent in the switch from anywhere within the attached network using Telnet, a Web browser, or other network management software such as EliteView. However, you must first configure the switch with a valid IP address, subnet mask, and default gateway. If you have trouble establishing a link to the management agent, check to see if you have a valid network connection. Then verify that you entered the correct IP address. Also, be sure the port through which you are connecting to the switch has not been disabled. If it has not been disabled, then check the network cabling that runs between your remote location and the switch.

Note: You can configure the management agent to accept from one to four simultaneous Telnet sessions. If the maximum number of sessions already exists, an additional Telnet connection will not be able to log into the system.

APPENDIX B
CABLES

Specifications

10BASE-T Twisted-Pair Cable		
Cable Type	**Category**	**Connector**
100-ohm UTP, 22 - 26 AWG 0.4 - 0.6 mm, 2 pairs	3, 4, 5	male, 8-pin RJ-45

100BASE-TX Twisted-Pair Cable		
Cable Type	**Category**	**Connector**
100-ohm UTP, 22 - 26 AWG 0.4 - 0.6 mm, 2 pairs	5	male, 8-pin RJ-45

100BASE-FX and 1000BASE-SX Duplex Fiber Cable	
Cable Type	**Connector**
62.5/125 or 50/125 micron core	SC

Note: If you need to connect to a device with 62.5/125 micron cable that has ST-type connectors, SMC provides an optional SC-ST Converter (Part Number: 99-012034-091).

Twisted-Pair Cable and Pin Assignments

Caution: DO NOT plug a phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform with FCC standards.

For 100BASE-TX/10BASE-T connections, a twisted-pair cable must have two pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be red and the other, red with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

Caution: Each wire pair must be attached to the RJ-45 connectors in a specific orientation. (See "Cabling Guidelines" on page 4-1 for an explanation.)

Figure B-1 illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.

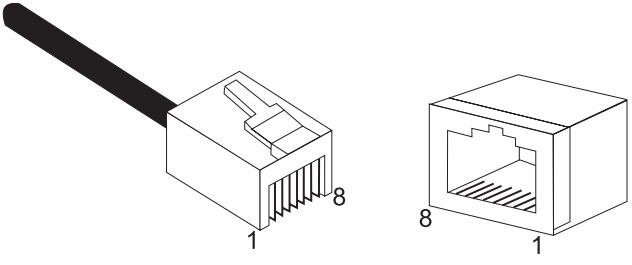

Figure B-1. RJ-45 Connector Pin Numbers

100BASE-TX/10BASE-T Pin Assignments

With 100BASE-TX/10BASE-T cable, pins 1 and 2 are used for transmitting data, and pins 3 and 6 for receiving data.

RJ-45 Pin Assignments	
Pin Number	**Assignment[1]**
1	Tx+
2	Tx-
3	Rx+
6	Rx-

1: The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

Straight-Through Wiring

If the twisted-pair cable is to join two ports and only one of the ports has an internal crossover (MDI-X), the two pairs of wires must be straight-through.

Straight-Through RJ-45 Pin Assignments	
End 1	**End 2**
1 (Tx+)	1 (Tx+)
2 (Tx-)	2 (Tx-)
3 (Rx+)	3 (Rx+)
6 (Rx-)	6 (Rx-)

Crossover Wiring

If the twisted-pair cable is to join two ports and either both ports are labeled with an "x" (MDI-X) or neither port is labeled with an "x" (MDI), a crossover must be implemented in the wiring.

Crossover RJ-45 Pin Assignments	
End 1	**End 2**
1 (Tx+)	3 (Rx+)
2 (Tx-)	6 (Rx-)
3 (Rx+)	1 (Tx+)
6 (Rx-)	2 (Tx-)

Console Port Pin Assignments

The DB-9 serial port on the switch's front panel is used to connect to the switch for out-of-band console configuration. The on-board menu-driven configuration program can be accessed from a terminal, a PC running a terminal emulation program, or from a remote location via a modem connection. The pin assignments used to connect to the serial port are provided in the following tables.

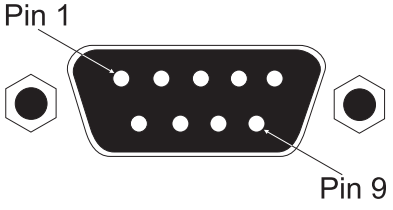

Figure B-2. DB-9 Console Port Pin Numbers

DB-9 Port Pin Assignments

EIA Circuit	CCITT Signal	Description	Switch's DB9 DTE Pin #	PC DB9 DTE Pin #	Modem DB25 DCE Pin #	Signal Direction DTE-DCE
CF	109	**DCD** (Data Carrier Detected)	1	1	8	<------
BB	104	**RxD** (Received Data)	2	2	3	<------
BA	103	**TxD** (Transmitted Data)	3	3	2	------>
CD	108.2	**DTR** (Data Terminal Ready)	4	4	20	------>
AB	102	**SG** (Signal Ground)	5	5	7	-------
CC	107	**DSR** (Data Set Ready)	6	6	6	<------
CA	105	**RTS** (Request-to-Send)	7	7	4	------>
CB	106	**CTS** (Clear-to-Send)	8	8	5	<------
CE	125	**RI** (Ring Indicator)	9	9	22	<------

Console Port to 9-Pin COM Port on PC

Switch's 9-Pin Serial Port	CCITT Signal	PC's 9-Pin COM Port
1 DCD	---------- DCD ----------	1
2 RXD	<--------- TXD ----------	3
3 TXD	---------- RXD ---------->	2
4 DTR	---------- DSR ---------->	6
5 SGND	---------- SGND ----------	5
6 DSR	---------- DTR ----------	4
7 RTS	---------- CTS ---------->	8
8 CTS	<--------- RTS ----------	7
9 RI	---------- RI ----------	9

Console Port to 25-Pin DCE Port on Modem

Switch's 9-Pin Serial Port	CCITT Signal	Modem's 25-Pin DCE Port
1	<--------- DCD ----------	8
2	<--------- RXD ----------	3
3	---------- TXD ---------->	2
4	---------- DTR ---------->	20
5	---------- SGND ----------	7
6	<--------- DSR ----------	6
7	---------- RTS ---------->	4
8	<--------- CTS ----------	5
9	<--------- RI ----------	22

Console Port to 25-Pin DTE Port on PC

Switch's 9-Pin Serial Port	Null Modem		PC's 25-Pin DTE Port
1 DCD	1	1	8 DCD
2 RXD	2	3	3 TXD
3 TXD	3	2	2 RXD
4 DTR	4	8	20 DTR
5 SGND	5	20	7 SGND
6 DSR	6	7	6 DSR
7 RTS	7	4	4 RTS
8 CTS	9	5	5 CTS
9 RI	20	6	22 RI

APPENDIX C
SPECIFICATIONS

Physical Characteristics

Ports
24 10BASE-T/100BASE-TX, with auto-negotiation
2 slots for optional single-port 1000BASE-SX media expansion modules

Network Interface
10BASE-T: RJ-45 (100-ohm, UTP cable; Categories 3, 4, 5)
100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5)
Ports 1-23: RJ-45 connectors, fixed crossover
Port 24: RJ-45 connector
switch selectable, crossover or straight-through
1000BASE-SX: SC connector
Multimode fiber cable; 62.5/125 or 50/125 microns

Buffer Architecture
24 Kbytes per 10/100 Mbps ports
96 Kbytes per 1000 Mbps ports

Aggregate Bandwidth
8.8 Gbps

Switching Database
12K MAC address entries

LEDs
System: Power
Port: Link/Activity, HDX/FDX
Module: Link/Activity

Weight
7.94 lbs (3.6 kg)

Size
17.37 x 11.22 x 1.7 in (44.0 x 28.5 x 4.3 cm)

Temperature
Operating: 32 to 122°F (0 to 50°C)
Storage: -40 to 158°F (-40 to 70°C)

Humidity
Operating: 5% to 95%

AC Input
100 to 240 V, 50 to 60 Hz

Power Supply
Internal, auto-ranging transformer: 100 to 240 VAC, 50 to 60 Hz

Power Consumption
80 Watts maximum

Heat Dissipation
273 BTU/hr maximum

Maximum Current
SMC6724L2: 0.80A @ 110VAC, 0.50A @ 240VAC

Switch Features

Spanning Tree Protocol

Forwarding Mode
Store-and-forward

Throughput
Wire speed

Flow Control
Full Duplex: IEEE 802.3x
Half Duplex: Back pressure

Broadcast Storm Control

VLAN Support
Up to 64 groups; port-based or with 802.1Q VLAN tagging, GVRP for automatic VLAN learning

Multicast Switching
IGMP Snooping

Quality of Service
Supports four levels of priority and Weighted Round Robin Queueing

Management Features

In-Band Management
Telnet, Web-based HTTP, or SNMP manager
(EliteView Network Management software provided for free)

Out-of-Band Management
RS-232 DB-9 console port

Software Loading
TFTP in-band or XModem out-of-band

MIB Support
MIB II (RFC 1213), Bridge MIB (RFC 1493), Ethernet-Like MIB (RFC 1643), RMON MIB (RFC 1757), SMC's private MIB

RMON Support
Groups 1, 2, 3, 9 (Statistics, History, Alarm, Event)

Additional Features
Port Trunks
Port Mirroring

Standards

IEEE 802.3 Ethernet, IEEE 802.3u Fast Ethernet
IEEE 802.3z Gigabit Ethernet
IEEE 802.1D Spanning Tree Protocol and traffic priorities
IEEE 802.1p priority tags
IEEE 802.3ac VLAN tagging
IEEE 802.1Q VLAN Bridge Management
IEEE 802.3x full-duplex flow control
ISO/IEC 8802-3
SNMP (RFC 1157), RMON (RFC 1757), ARP (RFC 826),
IGMP (RFC 1112), MIB II (RFC 1213), Bridge MIB (RFC 1493)

Compliances

CE Mark

Emissions
FCC Class A
Industry Canada Class A
EN55022 (CISPR 22) Class A
VCCI Class A
C-Tick - AS/NZS 3548 (1995) Class A

Immunity
IEC 1000-4-2/3/4/6

Safety
CSA/NRTL (CSA 22.2.950 & UL 1950)
EN60950 (TÜV/GS)

Warranty

Unit: Limited Lifetime

Slide-in Module

1000BASE-SX Extender Module

Model
SMC6724L2GSSC

Ports
1 1000BASE-SX

Network Interface
SC connector, 50/125 or 62.5/125 micron multimode fiber cable

Standards
802.3z Gigabit Ethernet

APPENDIX D
ORDERING INFORMATION

TigerSwitch 10/100 Products and Accessories	
Product Number	**Description**
SMC6724L2	24-port Fast Ethernet Switch with two media expansion slots
SMC6724L2GSSC	Gigabit Module with one 1000BASE-SX Port (SC-type Connector)
99-012034-091	SC to ST plug converter for fiber optic module

GLOSSARY

10BASE-T

IEEE 802.3 specification for 10 Mbps Ethernet over two pairs of Category 3, 4, or 5 UTP cable.

100BASE-FX

IEEE 802.3u specification for 100 Mbps Fast Ethernet over two strands of 50/125 or 62.5/125 micron core fiber cable.

100BASE-TX

IEEE 802.3u specification for 100 Mbps Fast Ethernet over two pairs of Category 5 UTP cable.

1000BASE-SX

IEEE 802.3z specification for Gigabit Ethernet over two strands of 50/125 or 62.5/125 micron core fiber cable.

Auto-Negotiation

Signalling method allowing each node to select its optimum operational mode (e.g., 10 Mbps or 100 Mbps and half or full duplex) based on the capabilities of the node to which it is connected.

Bandwidth

The difference between the highest and lowest frequencies available for network signals. Also synonymous with wire speed, the actual speed of the data transmission along the cable.

Class I Repeater

Fast Ethernet repeater that is principally used to connect different physical signaling systems (e.g., 100BASE-TX, 100BASE-FX) and that has an internal delay such that only one repeater of this type can reside within a single collision domain when maximum cable lengths are used.

Class II Repeater

Fast Ethernet repeater that typically supports a single physical signaling system (e.g., 100BASE-TX, or 100BASE-FX) and that has a smaller internal delay so that two such repeaters can reside within a single collision domain when maximum cable lengths are used.

Collision

A condition in which packets transmitted over the cable interfere with each other. Their interference makes both signals unintelligible.

Collision Domain

Single CSMA/CD LAN segment.

CSMA/CD

Carrier Sense Multiple Access/Collision Detect is the communication method employed by Ethernet and Fast Ethernet.

Crossover Port

Twisted-pair port with a built-in wiring crossover.

End Station

A workstation, server, or other device that does not act as a network interconnection.

Ethernet

A network communication system developed and standardized by DEC, Intel, and Xerox, using baseband transmission, CSMA/CD access, logical bus topology, and coaxial cable. The successor IEEE 802.3 standard provides for integration into the OSI model and extends the physical layer and media with repeaters and implementations that operate on fiber, thin coax and twisted-pair cable.

Fast Ethernet

A 100 Mbps network communication system based on Ethernet and the CSMA/CD access method.

Fast Ethernet Switch

Device that provides a full 100 Mbps bandwidth (or either 10 or 100 Mbps bandwidth with Auto-Negotiation) to each port (LAN segment).

Full Duplex

Transmission method that allows switch and network card to transmit and receive concurrently, effectively doubling the bandwidth of that link.

Gigabit Ethernet

A 1000 Mbps network communication system based on Ethernet and the CSMA/CD access method.

IEEE 802.3

Defines carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

IEEE 802.3u

Defines CSMA/CD access method and physical layer specifications for 100BASE-TX Fast Ethernet.

IEEE 802.3x

Defines Ethernet frame start/stop requests and timers used for flow control on full-duplex links.

IEEE 802.3z

Defines CSMA/CD access method and physical layer specifications for 1000BASE Gigabit Ethernet.

LAN Segment

Separate LAN or collision domain.

LED

Light emitting diode used for monitoring a device or network condition.

Link Segment

Length of twisted-pair or fiber cable joining a pair of repeaters or a repeater and a PC.

Local Area Network (LAN)

A group of interconnected computer and support devices.

Media Access Control (MAC)

A portion of the networking protocol that governs access to the transmission medium, facilitating the exchange of data between network nodes.

MIB

An acronym for Management Information Base. It is a set of database objects that contains information about the device.

MII

Media Independent Interface, the standard interface for Fast Ethernet—similar to the AUI interface for traditional Ethernet.

Network Diameter

Wire distance between two end stations in the same collision domain.

RJ-45 Connector

A connector for twisted-pair wiring.

Straight-through Port

An RJ-45 port which does not cross the receive and transmit signals internally so it can be connected with straight-through twisted-pair cable to any device having a crossover port. Also referred to as a "Daisy-Chain" port.

Switched Ports

Ports that are on separate collision domains or LAN segments. Transmission Control Protocol/Internet Protocol (TCP/IP) Protocol suite that includes TCP as the primary transport protocol, and IP as the network layer protocol.

UTP

Unshielded twisted-pair cable.

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From U.S.A. and Canada (8:30 AM - 8:00 PM Pacific Time)
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